Studies of the genus *Phalces* Stål

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Abstract

Phalces tuberculatus sp.n. is described from Eland's Bay, Cape Province, South Africa. A key is given to distinguish the *Phalces* species. Brief notes are given on behaviour, foodplants, and culture notes in the case of *P. longiscaphus* (de Haan).

Key words: Phasmida, *Phalces*, *Phalces tuberculatus* **sp.n.**

Introduction

As part of my studies on South African stick-insects, I visited Cape Town in September 1998. My research included an examination of the entomology collection at the South African Museum in Cape Town, in addition to material of *Phalces* species in various museums, observing *P. longiscaphus* in the wild and rearing this species in captivity. The observations include the description of *Phalces tuberculatus* sp.n. and a key to distinguish the three *Phalces* species (of which a Madagascan insect is unlikely to belong to this genus). Museum codens are given below:

BMNH Natural History Museum, London, U.K.
NHMW Naturhistorisches Museum, Wien, Austria.
RMNH Nationaal Natuurhistorisch Museum, Leiden, Netherlands.
SAMC South African Museum, Cape Town, South Africa.

Phalces Stål, 1875

Phalces Stål, 1875: 62, 102.

Characteristics of the genus

Body elongate, unarmed, smooth or granulated. Third antennal segment three times longer than second segment. In both sexes, fore femora unarmed; except for short pair of apical spines. Mid and hind femora in female with 1-2 pairs of subapical spines, sometimes a further 1 or 2 smaller spines; in male ranging from no spines to 2 pairs, usually smaller than in female. Pair of short apical spines present on all femora. Operculum in female with long chute-like extension. Cerci short, variable.

Key to males

1. Body with black median line. Only hind femora with 1-2 subapical spines. . . . . *P. unilineatus*
- Body all one colour, or with variegated blotches; lacking black median line. Mid and hind femora with 1 to 4 pairs of small black subapical spines (occasionally absent or very short) 2
2. Body smooth. Body length 50-55mm. . . . . *P. longiscaphus*
- Body with numerous tubercles/granulations, particularly on thorax. Body length 52-61.5mm. . . . . *P. tuberculatus* **sp.n.**

Key to females

(Note - colour forms may vary in each species - *P. unilineatus* unknown)

1. Body smooth. Body length 70-80mm. . . . . *P. longiscaphus*
- Body with numerous tubercles/granulations, particularly on thorax. Body length 86-93mm. . . . . *P. tuberculatus*

Phalces longiscaphus (de Haan). (Figures 1 & 2)

Phasma (*Bacillus*) *longiscaphum* de Haan, 1842: 101. Syntype series: 2 females, Cape of Good Hope [Prom. bon. spei], leg. Horstok [RMNH, Leiden] [examined].

Bacillus longiscaphum (de Haan); Westwood, 1859: 5.

Phalces longiscaphum (de Haan); Kirby, 1904: 336.

Phalces longiscaphus (de Haan); Redtenbacher, 1906: 28, pl. 2.1; Le Feuvre, 1936: 80, (incl. figures/plates of both sexes, nymphs and eggs); Brock, 1999: [in press].

Bacillus coccyx Westwood, 1859: 6, pl. 7.5. Syntype series: 2 females, "Africa australi" [BMNH, London] [examined] (synonymised by Kirby, 1904: 336).

Phalces coccyx (Westwood); Stål, 1875: 102.

Description

Male 50-55mm, female 70-80mm. Very stick-like, medium-sized, wingless insects with short antennae. The male is greenish brown with three bluish green marks and white bands on each of the pronotum, hind part of the mesonotum and metanotum. The legs are green, with a brown base and apical band on all femora; plain or slightly mottled in female. Females are usually brown or grey, perhaps speckled; occasionally green.

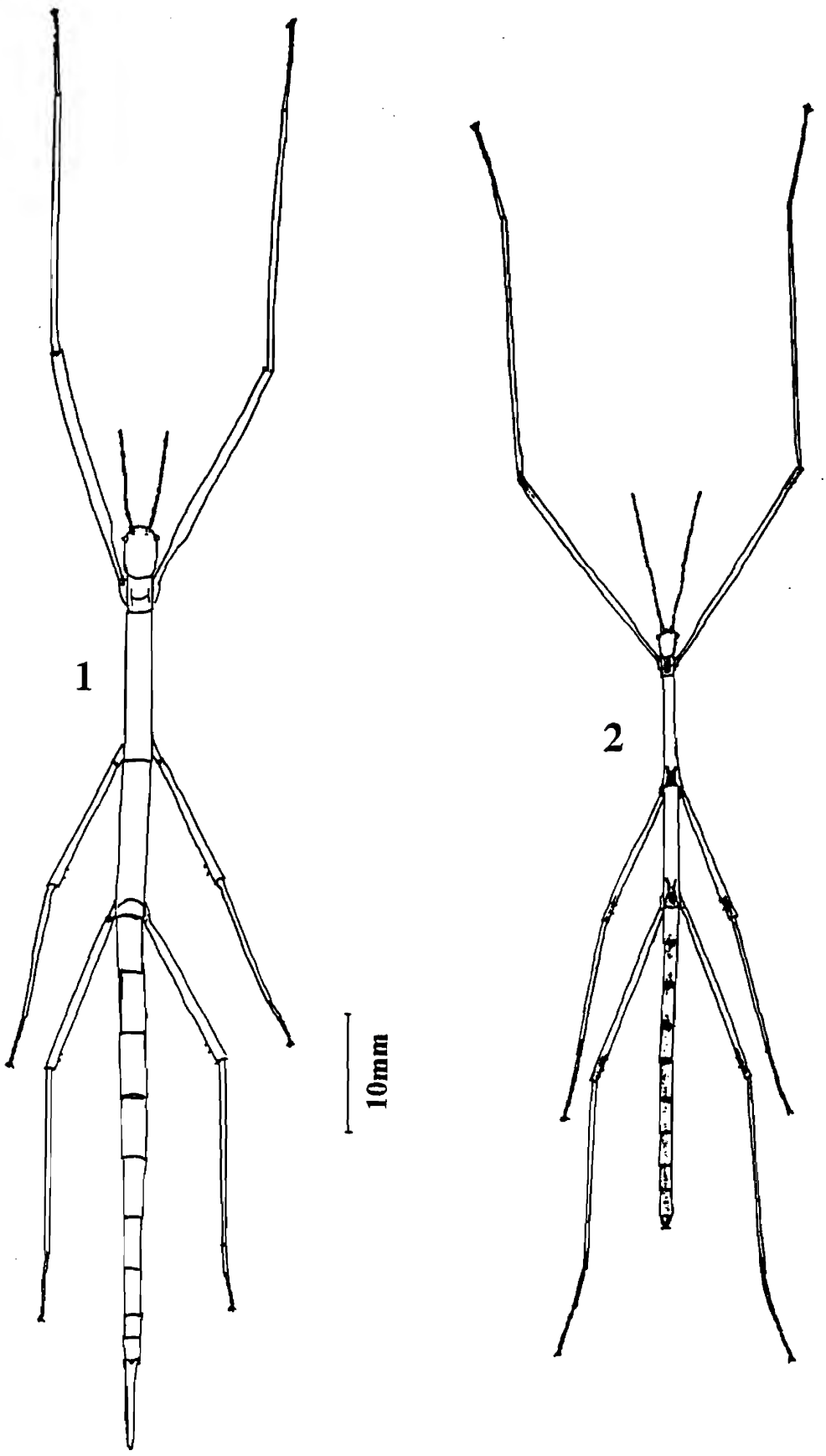
Head.- Longer than wide, eyes small, brown. Antennae short, 22 segments in male, 19 segments in female; basal segment rather broad, remainder of segments narrower. Second segment very short, broader than long. Third segment almost as long as basal segment. Other segments short except tip, which is as long, but narrower than 3rd segment.

Thorax.- Thorax smooth in both sexes. Pronotum a little shorter than head; central indentation present. Mesonotum 4 to just over 4 times length of pronotum. Metanotum about same length as mesonotum; first abdominal segment short.

Abdomen.- Long and slender. In male anal segment same length as 9th segment, tip subtruncate. Subgenital plate broad, slightly rounded at tip, which does not reach end of 9th segment. Cerci short, narrow, club shaped at tip (colour: white in nature, may be brown on dead specimens). In female, end of anal segment subtruncate; rounded supraanal plate visible beneath. The abdomen ends in a boat-shaped chute-like appendage, which varies considerably in length (Favrelle, 1938 illustrates such variation). Usually, the appendage is about 4 times the length of the anal segment, [i.e. extends beyond anal segment by about twice the length of that segment] but may be much longer, or occasionally shorter. Cerci short, narrow; slightly rounded at tip.

Legs.- Long, unarmed except mid and hind femora, which have 2-4 pairs of small black-tipped subapical spines (of which 2 pairs are smaller than others. Occasionally males have either very short spines, or they are absent). All femora with a pair of short apical spines. Tibiae slightly broadened at base. Legs slightly hairy.

Habits: This species mainly relies on its effective camouflage for protection. They hide in the daytime and are rarely seen, until evening when they return to food-plants. When disturbed, nymphs sway from side to side. Adults mate frequently producing a spermatophore (sperm sac). Compton & Ware (1991) reported that ants carry eggs of this species to their nests, using the capitulum (knob on the lid of the egg) in a similar way as elaisomes on seeds. The capitulum is removed and eaten without reducing egg viability. Le Feuvre (1936) had clearly observed this behaviour when commenting "...the ant begins its attacks even before hatching takes place by carrying off the eggs to its nest". However, he associated this behaviour with an attack, speculating that "At a later stage it pulls the newly-hatched insects to pieces to facilitate removal of its larder". In a later paper, Le Feuvre (1939) adds that ants are attracted to the spermatophore in mating pairs of this species; they



Figures 1-2. *Phalces longiscaphus*: 1) female, 2) male.

remove the small whitish-green sperical objects to take back to the nest. Whilst rearing *longiscaphus*, he also observed that a female introduced to the cage was savagely attacked by another female, resulting in part of a leg being bitten off.

Culture Notes: This species was reared in France in the mid 1930's (Favrelle, 1938), where it was considered to be able to breed parthenogenetically, as well as bisexually; and in the UK in 1968. This species is fairly straightforward to rear in partly ventilated cages at a temperature of about 21°C: eggs hatch in about 4-6 months. Le Feuvre (1936) reported that it takes nymphs 6 months to mature, after 5 moults, with nymphs often losing legs. Eggs are dropped to the ground by females; they are very glossy, dark brown with a lighter, but small capitulum; eggs are easily damaged and need to be handled carefully. A few eggs are laid each day and Le Feuvre noticed a bluish-grey membrane wrapped around some eggs, although I did not observe this. The females I found at Constantia Nek commenced egg-laying in mid-September, about 3 weeks after maturing and died by the end of December 1998. One male survived until June 1999, indicating that females may live longer in the wild than they survived in captivity. Eggs hatched from February-April 1999. The abdomens of fresh adult females are very thin, but fatten up prior to egg-laying.

Food-plants: As reported in Brock (1999) i.e. *Leptospermum laevigatum* (Myrtaceae), *Erica aemula* (Ericaceae), *Rhus* spp.(Anacardiaceae), *Passerina* spp. (Thymelaeaceae), *Rubus fruticosus* (Rosaceae), *Liparia splendens* (Leguminosae). [Le Feuvre, 1936, who also mentioned the "Yellow-wood tree" [likely to be a *Podocarpus* species, probably *P. latifolius*], although it was not clear if it was in connection with this species or *Macynia labiata* (Thunberg)]. In captivity feeds well on *Erica* spp. (Ericaceae), *Rubus fruticosus* (Rosaceae) and *Leptospermum scoparium* (Myrtaceae). Favrelle (1938) also refers to *Rosa* spp. (Rosaceae), *Quercus* spp. (Fagaceae) and *Tradescantia* (Commelinaceae).

Distribution: [PB = P. Brock, HR = H. Robertson]. All localities in Cape Province, South Africa, as follows: Harold Porter Botanical Gardens, Betty's Bay, 9.ix.1998 (1st and 2nd instar nymphs, 12mm & 20mm respectively) (PB); Bloukrans River, 20 miles ENE Plettenbergbaai (Günther, 1956); Cape Suburbs (Le Feuvre, 1936); Cape Town (BMNH); Cape of Good Hope Nature Reserve (PB); Cape Peninsular, leg. Lightfoot, vi.1913 (SAMC); Table Mountain, Blinkwater (Günther, 1956); Cedarberg (SAMC); Claremont (Günther, 1956); Constantia Nek, 8-14.ix.1998 (PB); Hout Bay (Günther, 1956); Kirstenbosch Botanical Gardens (Le Feuvre, 1936); Grahamstown (Compton & Ware, 1991); Kleinmond, 9-21.ii.1993 (HR); Langebaan (Günther, 1956); Maanschijnkop, 7 miles E Hermanus (Günther, 1956); Stellenbosch (BMNH); Swartbergpas, Platberg (Günther, 1956). Redtenbacher (1906) also lists "Ostafrika (Westwood), Grusien, Azkur coll. m." (coll. m = Brunner's collection in Wien) and Günther (1956) lists Royal Natal National Park, Tugela Valley, Natal. PB's records are all adults or last instar nymphs, except where stated (note - all type and non-type material in museum collections has been examined).

Etymology: The species name means long boat-shaped; referring to the "chute" (operculum) at the end of the female's abdomen.

Phalces tuberculatus sp.n. (Figures 3-7)

Holotype ♂, South Africa: Leipoldtville, Eland's Bay, C[ape] P[rovince], Mus[eum] Exp[edition], x.1947 (SAMC). Paratype series: ♂, 2♀♀, South Africa: Leipoldtville, Eland's Bay, C[ape] P[rovince], Mus[eum] Exp[edition], xi.1948; also ♀ nymph, same data as holotype (SAMC).

Description of male

Holotype male. A long, slender insect, with tubercles on head, thorax and abdomen. Uniform dark brown, with whitish dusting on thorax and abdomen.

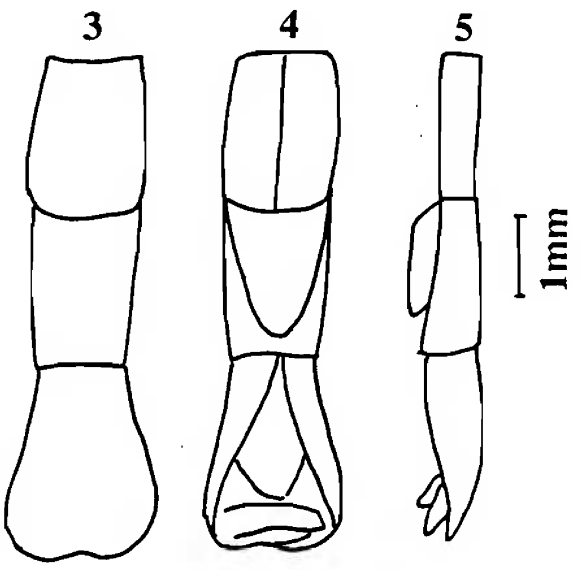
Head.- Longer than wide, slightly granulated near central carina; eyes small, brown with blackish flecks. Antennae short, 14 segments; basal segment very broad and elongate, remainder of segments narrower. Second segment very short, broader than long. Third segment almost as long as basal segment. Other segments short except tip, which is as long, but narrower than 3rd segment. The last few segments darker.

Thorax.- Pronotum a little shorter than head, with a number of small granulations or tubercles. Central indentation present. Mesonotum just over 4 times length of pronotum; with numerous small dark round tubercles, some around central area, including a few larger well spaced ones; hind part with smaller tubercles. Metanotum marginally longer than mesonotum, with a number of tubercles, mainly small. The tubercles extend to ventral surface of thorax.

Abdomen.- Long and slender; some granulations, 8th segment broadened towards tip. Anal segment same length as 9th segment, but broadened towards tip, which is bulbous and almost rounded. Subgenital plate broad and swollen, slightly rounded at tip, which does not reach end of 9th segment. Cerci stout, slightly rounded at tip; hidden beneath anal segment.

Legs.- Long, unarmed except mid and hind femora, which have 2 pairs of small black-tipped subapical spines (although all femora have short pair of apical spines). Tibiae slightly broadened at base. Legs slightly hairy. (note - right fore leg missing).

Paratype male same as holotype, but only 52mm. Also, hind part of metanotum with whitish marks, similar to those in *P. longiscaphus*.

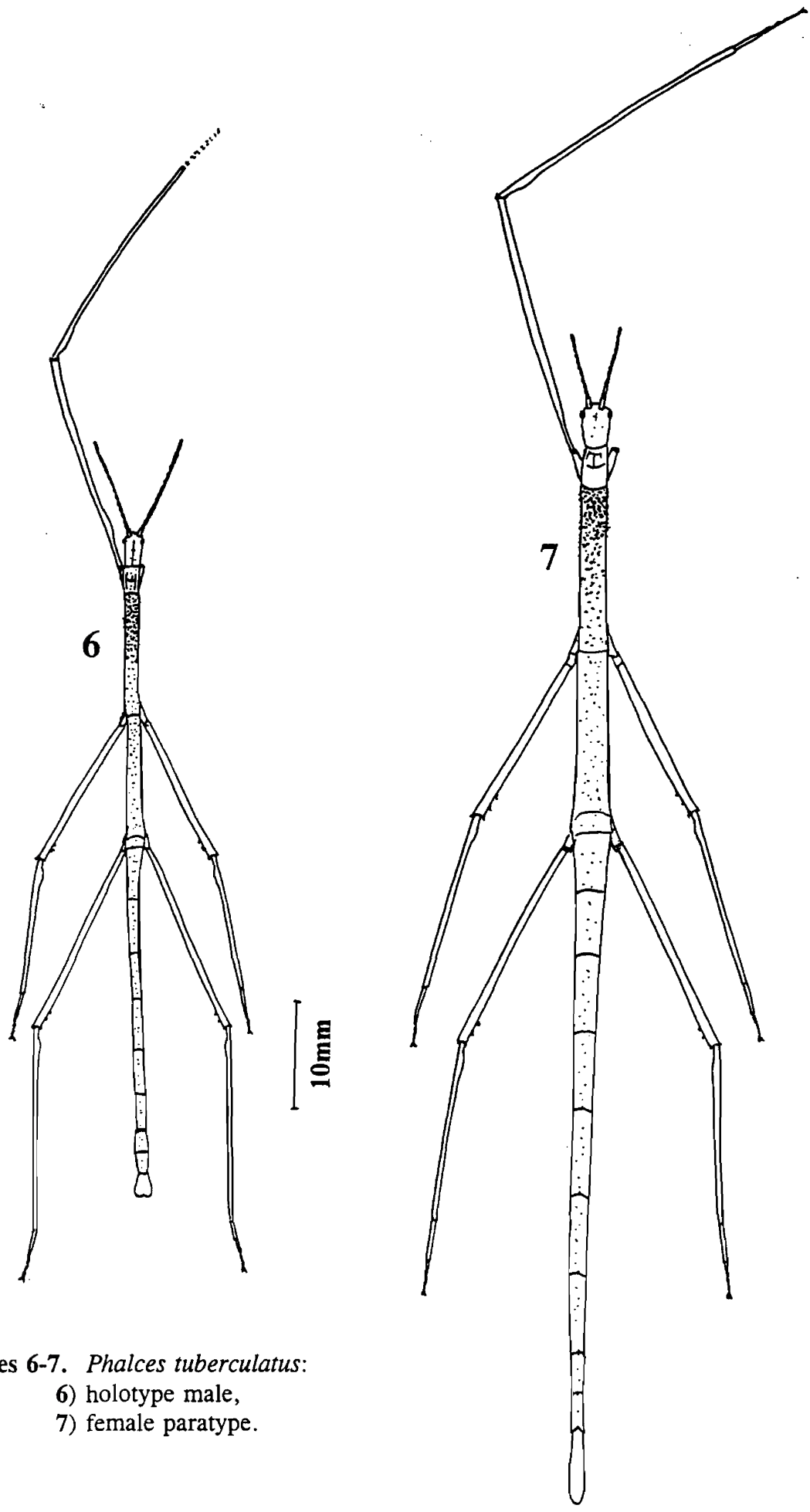


Figures 3-5. *Phalces tuberculatus*, end of male's abdomen: **3**) dorsal, **4**) ventral, **5**) lateral.

Description of Female

Length 86-93mm. Paratype females rather broader than male, dark brown, elongate insects with similar range of tubercles.

Head.- Longer than wide, slightly granulated near central carina; eyes small. Antennae short, 13 segments; basal segment very broad and elongate, remainder of segments narrower. Second segment very short, broader than long. Third segment almost as long as basal segment. Other segments short except tip, which is as long, but narrower than 3rd segment.



Figures 6-7. *Phalces tuberculatus*:
6) holotype male,
7) female paratype.

Thorax.- Pronotum a little shorter than head, with a number of small granulations or tubercles. Central indentation present. Front of segment with inverted "v" shaped indentation. Mesonotum just over 4 times length of pronotum; with numerous tubercles, some around central area. In one specimen 3 larger, uneven pairs of well spaced tubercles are present; hind part with smaller tubercles. Metanotum with mainly small tubercles; segment marginally longer than mesonotum. The tubercles extend to ventral surface of thorax.

Abdomen.- Long and slender, narrowing towards tip; some granulations present. Ninth and 10th segments shorter than previous segments. Anal segment longer than wide; with central circular incision leaving a two pronged structure. Anal segment longer than wide; almost 3mm long. Operculum long chute-like extension; spatulate, broadened towards tip, which is almost rounded. Operculum exceeds end of anal segment by about 1.5 times length of that segment. Cerci short, hidden beneath anal segment.

Legs.- Long, unarmed except mid and hind femora, which have 2 pairs of small black subapical spines (although all femora have pair of short apical spines). Tibiae slightly broadened at base.

Measurements (mm)

	Male holotype	Male paratype	Females
Body length	61.5	52	86-93
Head	3	2.2	4
Antennae	9.5	7	8
Pronotum	2.5	2	3.5
Mesonotum	11	9.5	14.5-15
Metanotum	11	10.5	13-14.5
Median segment	1	1	2
Cerci	1.5	1.2	0.5
Fore Femora	20	missing	21-24
Mid Femora	14	12	15
Hind Femora	18	16	19-20
Fore Tibiae	21	missing	22.5-25
Hind Tibiae	18	16.5	18-20

Distribution: Only known from Eland's Bay.

Etymology: Named *tuberculatus* in view of the numerous tubercles present on the body of this species.

Phalces unilineatus Redtenbacher (Figure 8)

Phalces unilineatus Redtenbacher, 1906: 28, pl. 3.2. Holotype ♂, Madagascar: central Meda, leg. Dr. H. Dohrn (NHMW, coll. no. 14) [examined].

This species is unlikely to belong to this genus because of the absence of spines on the mid femora (see key), hence a full description is not provided here. However, it is not appropriate to transfer it to another genus without the benefit of examining further material.

Figure 8.
Phalces unilineatus male (From Redtenbacher, 1906).

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